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Проблемы и возможности использования туманных вычислений в бангладешской системе управления транспортом

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Аннотация
Современные туманные вычисления считаются важной темой для исследования. Не только потому, что «туманные вычисления в транспортной системе» востребованы, но и значительно новы. Эффективные руководящие принципы необходимы для определения возможностей и рисков в этом секторе. Наша цель - выявить популярные риски в бангладешской системе управления транспортом и показать рекомендации по решению проблем. Мы также продолжим нашу работу по созданию точной оценки и анализа рисков и возможностей с использованием туманных вычислений в системе управления транспортом Бангладеш, которые будут полезны для исследователей в этой области, государственных органов, индивидуальных клиентов, студентов, инженеров, специалистов по туманным вычислениям и транспорта. соответствующие чиновники.
Ключевые слова: туманные вычисления, Транспортная система Бангладеш, туманные вычисления рисков и возможностей, интеллектуальная транспортная система

Challenges and Opportunities of using Fog Computing in Bangladesh Transport Management System

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Abstract
Now-a-days fog computing is considered as an important topic to research. Not only because "fog computing in transportation system" is highly demanded but also it is considerably new. Effective guidelines are needed to identify the

opportunities and risks in this sector. Our goal is to identify popular existing risks in Bangladeshi transport management system and show guideline to solve issues. We will also continue our work to create an accurate assessment and analysis for risks and opportunities using fog computing in Bangladesh Transport Management system which will be helpful for researchers in this field, government bodies, individual clients, students, engineers, fog computing specialists and transport related officials.

Keywords: fog computing; Bangladesh transport system; fog computing risks and opportunities; intelligent transport system;

Introduction: Poor infrastructure and unorganized transport system is considering as an obstacle for Bangladesh's recent economic and social growth. In order to solve the problems arising in the transport system, a concerted step must be taken for safe passage in the existing road network with foresight. One approach to prevent these problems is the development of an Intelligent Transport System (ITS). An Intelligent Transport System uses communication, processing and sensing technologies to improve the urban traffic and consequently the flow of vehicles in the urban road.

Goal: The unplanned development of Dhaka's infrastructure is associated with severe socio-economic problems. Such uncontrolled growth of Dhaka typically causes significant stress on city structures due to the unexpected demand of various resources and services. One of the most affected sectors is the transport systems, in which inefficiencies may lead to many negative consequences. And because of that unimaginable traffic jam in Dhaka is now observed not only by Bangladesh but also by whole world. So the main goal of our work is to analysis Challenges and Opportunities of using Fog Computing in Bangladesh Transport Management System in order to solve or minimize the problems related with this sector.

Fog Computing Definition: Fog computing [1, 2, 3, 4] or fog networking, also known as fogging,[5, 6] is an architecture that uses edge devices to carry out a substantial amount of computation, storage, and communication locally and routed over the internet backbone.

Both cloud computing and fog computing provide storage, applications, and data to end-users. However, fog computing is closer to end-users and has wider geographical distribution [7].

'Cloud computing' is the practice of using a network of remote servers hosted on the Internet to store, manage, and process data, rather than a local server or a personal computer[8]. Cloud computing can be a heavyweight and dense form of computing power.[citation needed]

The term 'Fog Computing' was defined by Prof. Jonathan Bar-Magen Numhauser in the year 2011 as part of his PhD dissertation project proposal. In January 2012 he presented the concept in the Third International Congress of Silenced Writings in the University of Alcala and published in an official source [1, 7].
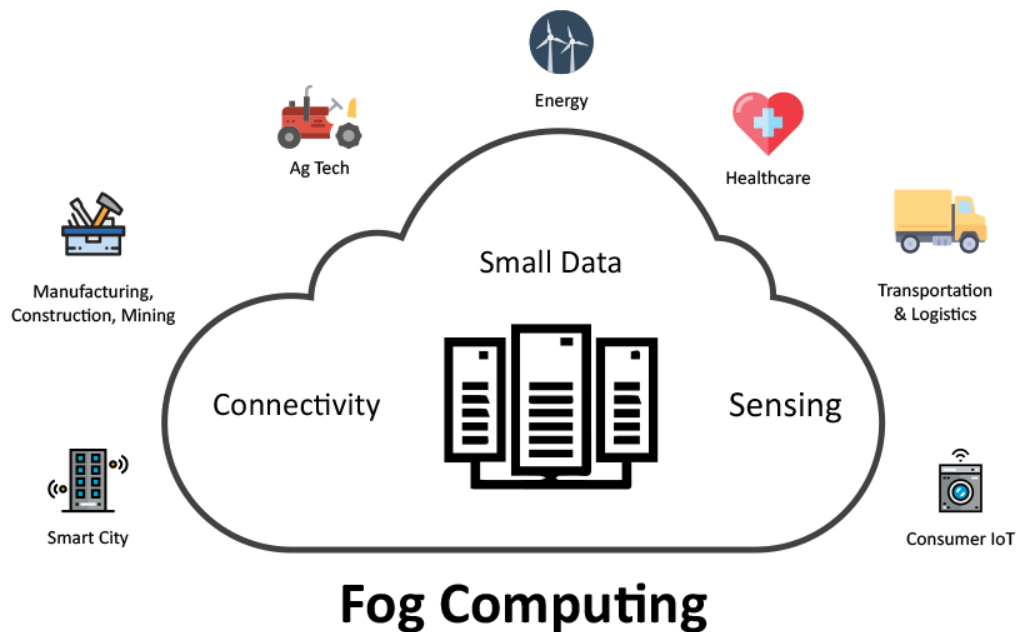
Figure 1. Fog Computing Architecture [16]

Also known as edge computing or fogging, fog computing facilitates the operation of compute, storage, and networking services between end devices and cloud computing data centers. While edge computing is typically referred to the location where services are instantiated, fog computing implies distribution of the communication, computation, storage resources, and services on or close to devices and systems in the control of end-users [9, 10]. Fog computing is a medium weight and intermediate level of computing power.[11] Rather than a substitute, fog computing often serves as a complement to cloud computing [12].

National Institute of Standards and Technology in March, 2018 released a definition of fog computing adopting much of Cisco's commercial terminology as NIST Special Publication 500-325, Fog Computing Conceptual Model, that defines fog computing as a horizontal, physical or virtual resource paradigm that resides between smart end-devices and traditional cloud computing or data center [13]. This paradigm supports vertically-isolated, latency-sensitive applications by providing ubiquitous, scalable, layered, federated, distributed computing, storage, and network connectivity. Thus fog computing is most distinguished by distance from the edge. In the theoretical model of fog computing, fog computing nodes are physically and functionally operative between edge nodes and centralized cloud [14]. Much of the terminology is undefined; including key architectural terms like "smart", and the distinction between fog-computing from edge computing is not generally agreed. Fog computing is more energy-efficient than cloud computing [15].

Bangladesh transport management system: Transport is an important part of Bangladesh's economy. Since the liberation of the country, the development of infrastructure has progressed rapidly and a number of land, water and air transport modes came into existence. However, significant progress needs to be made for

ensuring uniform access to all available transports. Unlike other nations, Bangladesh has four ministries responsible for transportation in the country:

- Road safety – Ministry of Road Transport and Bridges.
- Rail transport – Ministry of Railways.
- Civil aviation – Ministry of Civil Aviation and Tourism.
- Maritime transport – Ministry of Shipping [17].

RoadTransport: The Roads and Highways Department (RHD) has total length of 20,948 Km road under its control. RHD also control a total number of 4,659 bridges and 6,122 culverts.

RHD are currently operating about 161 ferry boats in 81 crossings (13 on national highways, 11 on regional highways and 57 on feeder roads) on its road network throughout the country. As of January 2010, Local Government Engineering Department (LGED) has so far constructed a total of 133,514 km (64,691 km dirt road and 68,823 km paved roads) upazila and union roads and 971,498 bridges/culverts. [18]

Air Transport: There are now 13 operational airports and Short Take-off and Landing (STOL) ports in Bangladesh. These are Dhaka, Barisal, Chittagong, Comilla, Cox's Bazar, Ishurdi, Jessore, Rajshahi, Syedpur, Sylhet and Thakurgaon. Of these, the airports at Dhaka, Chittagong and Sylhet serve international routes. Air cargo and STOL services have been handed over to the private sector by the government. Bangladesh can be reached by air from any part of the world. Several international carriers fly to and from Dhaka. [18]

Rail Transport: About 32% of the total area of Bangladesh is effectively covered by railways. Currently Bangladesh Railway had a total network of 2,835.04 km (Broad Gauge 659.33 km, Dual Gauge 374.83 km and Meter Gauge-1,800.88 km) and a total of 440 stations at the end of the year 2008-2009. Train services between Dhaka-Kolkata have been commenced on 14 April 2008 in order to establish communication between Bangladesh and India. After inclusion of railway track over the Jamuna Bridge, railway link between east and west zone has been established. [18]

Waterways Transport: The entire coast along the Bay of Bengal is 710 km long. There are two major ports in the country. Chittagong, the oldest port, has been an entry-port for at least 1,000 years. The Mongla port in Khulna region serves the western part of Bangladesh. [18]

Major problems related to Bangladesh Transport Management:

Bangladesh is not yet well developed in terms of transport and communication system. The reasons why this is happening are discussed below -

1. Due to the geography, climate, river erosion and floods, many obstacles are being impeded by the overall development projects.

2. In comparison to the population of Bangladesh, the amount of roadways, railways and waterways is insufficient.

3. The transport system of Bangladesh is basically urban. The villages are still largely deprived.

4. The transport system is at once uncertain. Trucks, lorries, coaches, launches, steamers, buses, trains do not comply at any time in the country.

5. The traffic control system is extremely inefficient and the technology is poor.

6. There are still conflicts with passengers on many routes over transportation problems and ownership issues.

7. Lack of modern and timely government policy.

Proposed Recommendations: The transport system of Bangladesh is neglected from that ancient period. So many things have changed in recent years for transport management system but still a long way to go. Experts believe that development is now possible because the government has taken major steps in the development of the transport sector including Metrorail, Padma Bridge, New Elevated Express, Flyover. But there are steps that can be taken considering the overall system -

1. Complete modernization of road transport system.

2. Research how new technologies could be useful, such as fog computing.

3. Learning from countries that are dealing with large populations in the same small places.

4. Developing effective policies for the adoption of technology following the developed world.

5. Increase the number of public transport and modernize the whole system.

6. Take action to maintain harmony with the workers, owners and passengers.

7. Usage of Modern technology and management system for considering disaster and regular natural calamities.

8. Time efficient policy to be implemented and its proper implementation at Government level.

Opportunities of using Fog Computing in Bangladesh Transport Management System [19]

- It can save network bandwidth.
- Useful for quick decisions.
- Lower operational costs.
- Preferable for better security.
- Quick decisions can be made.
- Data are analyzed locally instead of sending them to the cloud, which creates better management.
- Fog nods can join and leave the network anytime.
- Possible to install in remote locations.

Challenges of using Fog Computing in Bangladesh Transport Management System [19]

- Some security issues like IP address spoofing, wireless network security issues, man in middle attacks etc. can be occurred due to various reasons.
- Higher power consumption could be a big concern.

- High data consistency could be challenging due to lack of practices and skilled man power.
- Fog computing data management could be questionable.
- Trust and authentication are major concerns.
- Scheduling is complex in fog computing, it could be a major issue.

Conclusion: The Fog computing is currently in its infancy, this is why it is essential to learn more about it. As a decentralized service, fog computing raises a number of concerns with regards to security. And also when it is come to applying in Bangladesh Transport Management System more realistic analysis and expert reviews are essential. Also more researches are obligatory to check the risks and opportunities of using Fog Computing in Bangladesh Transport Management System.

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